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PART I—(Continued)

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9. PONTHEIVA R. Br.

Key to Species

- Leaves 5-8, long-petiolate; sepals 5-7-nerved; labellum sessile, narrowed at the apex.....1. *P. petiolata*
 Leaves 3-6, short-petiolate; sepals 3-nerved; labellum unguiculate, truncate at the apex and long apiculate.....2. *P. racemosa*

1. PONTHEIVA PETIOLATA Lindl.

Bot. Reg. ix. t. 960 (1823); Griseb. Fl. Br. W.I.I. 638 (1864); Cogn. in Urb. Symb. Ant. vi. 362 (1909); Stehlé, Fl. Descr. Ant. Franc. i. 105 (1939).

A species with scattered distribution from Cuba to Grenada; in Dominica occasional in woodlands and mountain forests at middle and higher elevations—Lisdara (367); Morne Anglais (368); Morne Colla Anglais (369); Morne Trois Pitons (370). Collected in flower in August.

2. PONTHEIVA RACEMOSA (Walt.) Mohr (Fig. 98)

In Contrib. U. S. Natl. Herb. vi. 460 (1901); Britt. & Wils. Bot. P.R. v. 192 (1924); Stehlé, Fl. Descr. Ant. Franc. i. 106 (1939). *P. glandulosa* (Sims) R. Br., Griseb. Fl. Br. W.I.I. 638 (1864); Cogn. in Urb. Symb. Ant. vi. 363 (1909); Fawc. & Rend. Fl. Jam. i. 37 (1910). *Arethusa racemosa* Walt. Fl. Car. 222 (1788).

Found in the United States from Virginia south, and throughout much of tropical America; in Dominica probably to be found in habitats similar to those occupied by the preceding species—at middle elevations. I have seen no Dominica material but an Imray specimen is cited by Grisebach while Cogniaux apparently saw Eggers 36 (Morne Gombo), and Nicholls collections (132, 134, 135).



FIG. 97. *Cranichis muscosa*. 1, plant ($\times \frac{1}{2}$); 2, flower, side view ($\times 5$); 3, flower, front view, partly spread open ($\times 5$); 4, lip ($\times 10$). *Prescottia oligantha*. 5, plant ($\times \frac{1}{2}$); 6, flower, side view, with lateral sepal and petal turned back ($\times 10$); 7, flower, front view ($\times 10$); 8, flower, spread open ($\times 10$). Drawn by G. W. Dillon.

10. MALAXIS Soland. ex Sw.

Key to Species

- Flowers in very short, corymbiform racemes.....1. *M. umbelliflora*
 Flowers in somewhat elongate racemes.
 Labellum distinctly trilobate.....2. *M. spicata*
 Labellum entire, hastate, narrow, acute.....3. *M. massonii*

1. MALAXIS UMBELLIFLORA Sw.

Prodr. 119 (1788); Fawc. & Rend. Fl. Jam. i. 42 (1910). *Microstylis umbellulata* Lindl., Griseb. Fl. Br. W.I.I. 612 (1864). *M. umbelliflora* (Sw.) Hitchc., Cogn. in Urb. Symb. Ant. vi. 371 (1909); Stehlé, Fl. Descr. Ant. Franc. i. 72 (1939).

Of scattered occurrence in tropical America; in Dominica apparently rare in wet mountain forests at middle elevations. I have seen no Dominica material but Grisebach cites an Imray specimen, and Cogniaux a specimen of Eggers (877).

2. MALAXIS SPICATA Sw. (Fig. 99)

Prodr. 119 (1788); Fawc. & Rend. Fl. Jam. i. 42 (1910); Britt. & Wils. Bot. P.R. v. 193 (1924). *Microstylis spicata* (Sw.) Lindl., Griseb. Fl. Br. W.I.I. 612 (1864); Cogn. in Urb. Symb. Ant. vi. 368 (1909); Stehlé, Fl. Descr. Ant. Franc. i. 70 (1939).

A West Indian species; in Dominica occasional in mossy forests on the upper slopes of the higher mountains—Morne Plat Pays (1679); Morne Anglais (355); Morne Trois Pitons (356); Morne Negre Maron (1064); Fon Pays (2860). Apparently in flower throughout the year.

3. MALAXIS MASSONII (Ridl.) O. Ktze.

Rev. Gen. ii. 673 (1891). *Microstylis massonii* Ridl. in Journ. Linn. Soc. Lond., Bot. xxiv. 323 (1887); Cogn. in Urb. Symb. Ant. vi. 369 (1909).

Rare, probably to be found in habitats occupied by the preceding two species. A single Imray specimen cited by Cogniaux is the only known Dominica record for this species.

11. LIPARIS Rich.

1. LIPARIS ELATA Lindl. (Fig. 100)

Bot. Reg. xiv. t. 1175 (1828); Griseb. Fl. Br. W.I.I. 612 (1864); Cogn. in Urb. Symb. Ant. vi. 374 (1909); Fawc. & Rend. Fl. Jam. i. 46 (1910); Britt. & Wils. Bot. P.R. v. 194 (1924); Stehlé, Fl. Descr. Ant. Franc. i. 73 (1939).

Widespread from southern Florida to Ecuador and Brazil; in Dominica apparently rare in moist forests at lower and middle elevations. An Imray specimen cited by Grisebach is the sole record of this species for Dominica.

12. EULOPHIA R. Br.

1. EULOPHIA ALTA (L.) Fawc. & Rendle (Fig. 101)

Fl. Jam. i. 112 (1910). *Cyrtopera woodfordii* (Sims) Lindl., Griseb. Fl. Br. W.I.I. 630 (1854). *C. longifolia* (Kunth) Reichb. f., Cogn. in Urb. Symb. Ant. vi. 575 (1910). *C. alta* (L.) Stehlé, Fl. Descr. Ant. Franc. i. 69 (1939). *Platypus altus* (L.) Small, Britt. & Wils. Bot. P.R. v. 208 (1924). *Limodorum altum* L. Syst. ed. 12. ii. 594 (1767).



FIG. 98. *Ponthieva racemosa*. Plant ($\times 1$). Drawn by Blanche Ames.

Of wide occurrence in tropical America; in Dominica very occasional in wet sunny or shady soils at middle elevations—Mt. Joy (357); Sylvania (358, 359, 3830). Collected in flower in May and in August.

13. VANILLA Plum. ex L.

1. VANILLA INODORA Schiede

In Linnaea iv. 574 (1829); Cogn. in Urb. Symb. Ant. vi. 320 (1909); Fawc. & Rend. Fl. Jam. i. 17 (1910); Britt. & Wils. Bot. P.R. v. 185 (1924); Stehlé, Fl. Descr. Ant. Franc. i. 108 (1939). *Vanilla anaromatica* Griseb. Fl. Br. W.I.I. 638 (1864).

Widespread in the circum-Caribbean area; in Dominica rare, climbing upon tree trunks in mountain forests at middle elevations—Lisdara (387); La Chaudière (3671).

The common vanilla of commerce, *Vanilla planifolia* Andrews (*Vanilla fragrans* (Salisb.) Ames) (Fig. 102), is cultivated in Dominica as a garden crop by both negro peasants and Caribs. *Vanilla pompona* Schiede, a Central and South American species cultivated elsewhere for its aromatic properties, is also established in Dominica. These economic species are likely to be found under naturalized conditions but are not too difficult to distinguish. The leaves of the cultivated species are generally no longer than the internodes, and the floral bracts are small, not foliaceous. In *V. inodora*, however, the leaves are much longer than the internodes and the floral bracts are large and leafy.

During World War II the value of vanilla beans exported from Dominica exceeded all other local agricultural exports. For an account of this industry see "Vanilla-growing on Dominica" by Leo H. Narodny (Journal of the New York Botanical Garden 48 (1947) 33-37).

14. BRASSAVOLA R. Br.

1. BRASSAVOLA CUCULLATA (L.) R. Br.

In Ait. Hort. Kew. ed. 2. v. 216 (1813); Griseb. Fl. Br. W.I.I. 620 (1864); Cogn. in Urb. Symb. Ant. vi. 554 (1910); Stehlé, Fl. Descr. Ant. Franc. i. 113 (1939). *Epidendrum cucullatum* L. Sp. Pl. ed. 2. 1350 (1763); Britt. & Wils. Bot. P.R. v. 203 (1924).

A Lesser Antillean species recorded also from Venezuela and Mexico; in Dominica apparently rare, growing on rocks or sometimes trees at lower elevations. The only local record of this showy orchid is an Imray specimen cited by Grisebach. Stehlé records that in Guadeloupe the species is in flower from September to May.

15. ISOCHILUS R. Br.

1. ISOCHILUS LINEARIS (Jacq.) R. Br.

In Ait. Hort. Kew. ed. 2. v. 209 (1813); Griseb. Fl. Br. W.I.I. 623 (1864); Cogn. in Urb. Symb. Ant. vi. 458 (1910); Fawc. & Rend. Fl. Jam. i. 78 (1910); Britt. & Wils. Bot. P.R. v. 195 (1924); Stehlé, Fl. Descr. Ant. Franc. i. 115 (1939). *Epidendrum lineare* Jacq. Enum. 29 (1760).



FIG. 99. *Malaxis spicata*. 1 and 2, plants ($\times 1$). 3, flower, front view ($\times 6$). 4, dorsal sepal ($\times 6$). 5, petal ($\times 6$). 6, fruits ($\times 1$). Drawn by Blanche Ames.

Common throughout tropical America; in Dominica occasional, gregarious on trees at middle elevations—Morne Plat Pays (1730); Laudat (1825); Sylvania (352). Probably in flower throughout the year.

16. JACQUINIELLA Schltr.

1. JACQUINIELLA GLOBOSA (Jacq.) Schltr. (Fig. 103)

In Repert. Beihefte vii. 124 (1920); Britt. & Wils. Bot. P.R. v. 197 (1924); Stehlé, Fl. Descr. Ant. Franc. i. 168 (1939); *Epidendrum globosum* Jacq. Enum. 29 (1760); Griseb. Fl. Br. W.I.I. 619 (1864); Cogn. in Urb. Symb. Ant. vi. 481 (1910); Fawc. & Rend. Fl. Jam. i. 99 (1910).

Found throughout tropical America; in Dominica a common epiphyte on forest trees principally at middle elevations—Lisdara (2330, 2487); Morne Anglais (2315); Laudat (1748); Sylvania (354); Milton (2583). Probably to be found in flower throughout the year.

17. SCAPHYGLOTTIS Poepp. et Endl.

1. SCAPHYGLOTTIS MODESTA (Reichb. f.) Schltr.

In Fedde, Rep. Spec. Nov. xxiii. 46 (1926). *Tetragamestus modestus* Reichb. f. in Bonplandia ii. 21 (1854); Cogn. in Urb. Symb. Ant. vi. 460 (1910); Britt. & Wils. Bot. P.R. v. 195 (1924); Stehlé, Fl. Descr. Ant. Franc. i. 119 (1939).

A species recorded from Haiti, Puerto Rico, Dominica, Martinique, Grenada, and Southern Brazil; in Dominica very rare as a pendent epiphyte on forest trees at middle elevations—in valley of the Pegoua River, vicinity of Deux Branches (3116, 3435). Collected in bud in May.

18. POLYSTACHYA Hook.

1. POLYSTACHYA LUTEOLA Hook. (Fig. 104)

Exot. Fl. t. 103 (1825); Griseb. Fl. Br. W.I.I. 628 (1864); Cogn. in Urb. Symb. Ant. vi. 381 (1909). *P. minuta* (Aubl.) Britton, Fawc. & Rend. Fl. Jam. i. 48 (1910); Britt. & Wils. Bot. P.R. v. 194 (1924); Stehlé, Fl. Descr. Ant. Franc. i. 174 (1939).

A pantropical species; in Dominica a very common epiphyte in woodlands and forests at middle elevations—between Belle Vue and Grand Bay (364); Lisdara (361, 362, 363, 2329); Morne Brule, east of Portsmouth (365); Sylvania (366, 1084); Syndicate Orchards (2908). Flowering material has been collected in February, March, April, and August.

19. EPIDENDRUM L.

Key to Species

- a. Pseudobulbs present, the stems above with 1, 2 or (rarely) 3 leaves.
 - b. Leaf-apices rounded-obtuse, frequently retuse; flowers entirely white; lip 3-lobed, the lobes fringed. 1. *E. ciliare*
 - b. Leaf-apices usually acutish to acuminate; lip (at least) not pure white, entire.
 - Leaf-apices acutish, not long acuminate; flowers greenish-white with brownish-purple streaks on the lip. 2. *E. fragrans*
 - Leaf-apices long acuminate; flowers greenish with a purple lip. 3. *E. cochleatum*



FIG. 100. *Liparis elata*. 1, plant ($\times \frac{1}{4}$); 2, inflorescence ($\times 1\frac{1}{3}$); 3, flower, front view ($\times 5$); 4, flower, side view ($\times 5$); 5, petal ($\times 5$); 6, lateral sepal ($\times 5$); 7, pollinia (enlarged). Original drawing by Blanche Ames; redrawn by G. W. Dillon.

- a. Pseudobulbs absent, the stems usually with many leaves.
- c. Floral bracts inconspicuous, much shorter than the flowers.
- d. Leaf-apices bluntly obtuse.
 - e. Flowers apparently solitary, white or greenish-white; lip deeply 3-lobed.....4. *E. nocturnum*
 - e. Flowers not solitary.
 - Flowers umbellate, greenish-yellow, less than 2 cm. across; lip slightly 4-lobed; umbels few-flowered, shorter than the leaves.....5. *E. difforme*
 - Flowers paniculate, yellowish-white with purplish streaks on the lip, 2 cm. or more across; lip 3-lobed; panicles many-flowered, much longer than the leaves.....6. *E. mutelianum*
- d. Leaf-apices acute.
 - f. Flowers in racemes.
 - Racemes few-flowered, shorter than the leaves; flowers yellow.....7. *E. jamaicense*
 - Racemes often many-flowered, usually longer than the leaves (if shorter the flowers not yellow).
 - Flowers in a crowded, head-like raceme, tan with a buff-colored lip.....8. *E. anceps*
 - Flowers many, rose-colored with a white lip spotted with yellow.....9. *E. secundum*
 - f. Flowers in panicles.
 - g. Lip entire; flowers greenish-yellow.....10. *E. vincentinum*
 - g. Lip trilobed.
 - Petals linear-subspatulate, 1-3 nerved; sepals much narrower than the petals.....11. *E. discoidale*
 - Petals lanceolate-subspatulate, 5-nerved, obtuse; sepals as narrow as the petals; flowers white with magenta ridges on the lip.....12. *E. pallidiflorum*
- c. Floral bracts large, broad, concave, spathe-like, enclosing the ovary or even the flower.
 - h. Leaf-apices acute, not emarginate.
 - Stems densely fasciculate, with many persistent leaves; flowers spicate, greenish, sessile.....13. *E. miserrimum*
 - Stems several, not densely fasciculate, with few marcescent leaves; flowers sessile, in a simple panicle.....14. *E. durum*
 - h. Leaf-apices obtuse or emarginate.
 - i. Spikes much longer than the leaves; flowers greenish-yellow.....15. *E. rigidum*
 - i. Spikes equal to or shorter than the leaves.
 - Plants small, less than 15 cm. tall; leaves seldom over 3 cm. long and 8 mm. wide; spikes strobiliform with several whitish, greenish, or reddish flowers.....16. *E. strobiliferum*
 - Plants usually 30 cm. or more tall; leaves 4-6 cm. long, 8-10 mm. wide; inflorescence very few-flowered, the flowers greenish or whitish.....17. *E. ramosum*

1. EPIDENDRUM CILIARE L. (Fig. 105)

Syst. ed. 10. 1246 (1759); Griseb. Fl. Br. W.I.I. 615 (1864); Cogn. in Urb. Symb. Ant. vi. 507 (1910); Fawc. & Rend. Fl. Jam. i. 84 (1910); Stehlé, Fl. Descr. Ant. Franc. i. 130 (1939).

Widespread in the West Indies and on the continent from Mexico to northern South America; common in Dominica at lower elevations in sun on rocks, stumps, trees, or on the ground—Badineau, near Ridgefield (2229); Bath Estate; Morne Brule, east of Portsmouth (379); Calibishie (3143); Marigot (377, 378); Hatton Garden (3047); Carib Reserve (3405).

One of the most showy and common of Dominica orchids. In flower from March to June.



FIG. 101. *Eulophia alta*. 1, plant ($\times \frac{1}{6}$); 2, inflorescence ($\times \frac{3}{4}$); 3, lip and column, front view, lip spread open ($\times 1\frac{2}{3}$). Drawn by Blanche Ames.

2. EPIDENDRUM FRAGRANS Sw.

Prodr. 123 (1788); Griseb. Fl. Br. W.I.I. 615 (1864); Cogn. in Urb. Symb. Ant. vi. 510 (1910); Fawc. & Rend. Fl. Jam. i. 85 (1910); Stehlé, Fl. Descr. Ant. Franc. i. 133 (1939).

A circum-Caribbean species; in Dominica apparently rare, epiphytic in deep forests. An Imray specimen is cited by Grisebach but I have seen no Dominica material.

3. EPIDENDRUM COCHLEATUM L. (Fig. 106)

Sp. Pl. ed. 2. 1351 (1763); Griseb. Fl. Br. W.I.I. 616 (1864); Cogn. in Urb. Symb. Ant. vi. 508 (1910); Fawc. & Rend. Fl. Jam. i. 85 (1910); Stehlé, Fl. Descr. Ant. Franc. i. 132 (1939). *Anacheilium cochleatum* (L.) Hoffmg., Britt. & Wils. Bot. P.R. v. 198 (1924).

Common in the circum-Caribbean area; in Dominica occasional on rocks, stumps or trees in woodlands at lower and middle elevations—South Chiltern (1552), flowering in January.

4. EPIDENDRUM NOCTURNUM Jacq. (Fig. 107)

Enum. Pl. Carib. 29 (1760); Griseb. Fl. Br. W.I.I. 619 (1864); Cogn. in Urb. Symb. Ant. vi. 522 (1910); Fawc. & Rend. Fl. Jam. i. 87 (1910); Stehlé, Fl. Descr. Ant. Franc. i. 143 (1939). *Amphiglottis nocturna* (Jacq.) Britton, Britt. & Wils. Bot. P.R. v. 200 (1924).

Ranging from southern Florida through the West Indies and Central America to northern South America; in Dominica occasional as an epiphyte of wet forests at middle elevations—road between Belle Vue and Grand Bay (382); La Chaudière (3545). Collected in flower in May and August.

5. EPIDENDRUM DIFFORME Jacq. (Fig. 108)

Enum. Pl. Carib. 29 (1760); Cogn. in Urb. Symb. Ant. vi. 524 (1910); Fawc. & Rend. Fl. Jam. i. 88 (1910); Stehlé, Fl. Descr. Ant. Franc. i. 145 (1939). *E. umbellatum* Sw., Griseb. Fl. Br. W.I.I. 618 (1864). *E. latilabre* Lindl., Cogn. loc. cit. *Amphiglottis difformis* (Jacq.) Britton, Britt. & Wils. Bot. P.R. v. 200 (1924).

Ranging from southern Florida to northern South America; in Dominica common, epiphytic on forest trees at middle elevations—La Chaudière (3543); Lisdara (380, 2470); near falls of the Massacre River (1034); Morne Anglais (381); Morne Colla Anglais (374); Mt. Joy (1260); South Chiltern (1473). Collected in flower in February and March.

6. EPIDENDRUM MUTELIANUM Cogn.

In Urb. Symb. Ant. vi. 530 (1910); Stehlé, Fl. Descr. Ant. Franc. i. 153 (1939).

A species of Guadeloupe, Dominica, and Martinique; rare in Dominica in rain forests at middle elevations and mossy forests at highest elevations. Cogniaux cites a Duss specimen from Dominica, the only record of this species from the island. Stehlé records that in the French Islands this species blooms from February to July.

7. EPIDENDRUM JAMAICENSE Lindl.

Fol. Orch. Epid. 82 (1853); Griseb. Fl. Br. W.I.I. 618 (1864); Cogn. in Urb. Symb. Ant. vi. 515 (1910); Fawc. & Rend. Fl. Jam. i. 88 (1910).



FIG. 102. *Vanilla planifolia*. 1, plant ($\times \frac{1}{2}$); 2, lip, front-side view, in natural position ($\times 1$); 3, lip, spread open ($\times 1$); 4, column, front-side view ($\times 2$). Drawn by G. W. Dillon.

Apparently known only from Jamaica and Dominica, on the latter island occasional as an epiphyte in forests at middle elevations—in valley of Pegoua River vicinity of Deux Branches (3427); Syndicate Orchards (2764). Specimens collected in flower in April and May.

8. *EPIDENDRUM ANCEPS* Jacq.

Sel. Stirp. Amer. 224 (1763); Cogn. in Urb. Symb. Ant. vi. 516 (1910); Fawc. & Rend. Fl. Jam. i. 90 (1910); Stehlé, Fl. Descr. Ant. Franc. i. 134 (1939). *E. fuscatum* Sw., Griseb. Fl. Br. W.I.I. 617 (1864). *Amphiglottis anceps* (Jacq.) Britton, Britt. & Wils. Bot. P.R. v. 200 (1924).

Widespread from southern Florida to northern South America; in Dominica common as an epiphyte in woodlands and forests at middle elevations—Falls in Roseau River, below Laudat (1995); La Chaudière (3537, 3602, 3669); Lisdara (375, 2434); Morne Diablotin (2847); in valley of Pegoua River, vicinity of Deux Branches (3113); Ridgefield (2218); South Chiltern (1553); Sylvania (376, 1173). Collected in flower from March through May.

9. *EPIDENDRUM SECUNDUM* Jacq.

Enum. Pl. Carib. 29 (1760); Cogn. in Urb. Symb. Ant. vi. 519 (1910); Stehlé, Fl. Descr. Ant. Franc. 136 (1939); *E. elongatum* Jacq., Griseb. Fl. Br. W.I.I. 617 (1864). *Amphiglottis secunda* (Jacq.) Britton, Britt. & Wils. Bot. P.R. v. 201 (1924).

In the Antilles from Puerto Rico to Trinidad, also Brazil; rare in Dominica as an epiphyte in rain forests and mossy forests at middle to higher elevations. I have seen no Dominica material but Grisebach cites an Imray specimen from the island. According to Stehlé the species is in bloom on the French islands, from February to April and from July to November.

10. *EPIDENDRUM VINCENTINUM* Lindl.

In Hook. Journ. Bot. iii. 88 (1841); Griseb. Fl. Br. W.I.I. 619 (1864); Cogn. in Urb. Symb. Ant. vi. 526 (1910); Stehlé, Fl. Descr. Ant. Franc. i. 149 (1939).

A Lesser Antillean species ranging from Guadeloupe to St. Vincent; in Dominica rare, epiphytic at higher elevations. The sole Dominica record for this species is an Eggers specimen cited by Cogniaux. Stehlé records that it is in flower in Martinique and Guadeloupe from January to September.

11. *EPIDENDRUM DISCOIDALE* Lindl.

Fol. Orch. Epid. 54 (1853); Griseb. Fl. Br. W.I.I. 616 (1864); Cogn. in Urb. Symb. Ant. vi. 528 (1910).

This apparently rare species is known only from a single Jamaica collection and a similar Dominica specimen collected by Imray (257) is cited by both Grisebach and Cogniaux.

12. *EPIDENDRUM PALLIDIFLORUM* Hook.

In Bot. Mag. t. 2980 (1830); Griseb. Fl. Br. W.I.I. 616 (1864); Cogn. in Urb. Symb. Ant. vi. 529 (1910); Stehlé, Fl. Descr. Ant. Franc. i. 152 (1939). *Amphiglottis pallidiflora* (Hook.) Britton, Britt. & Wils. Bot. P.R. v. 201 (1924).

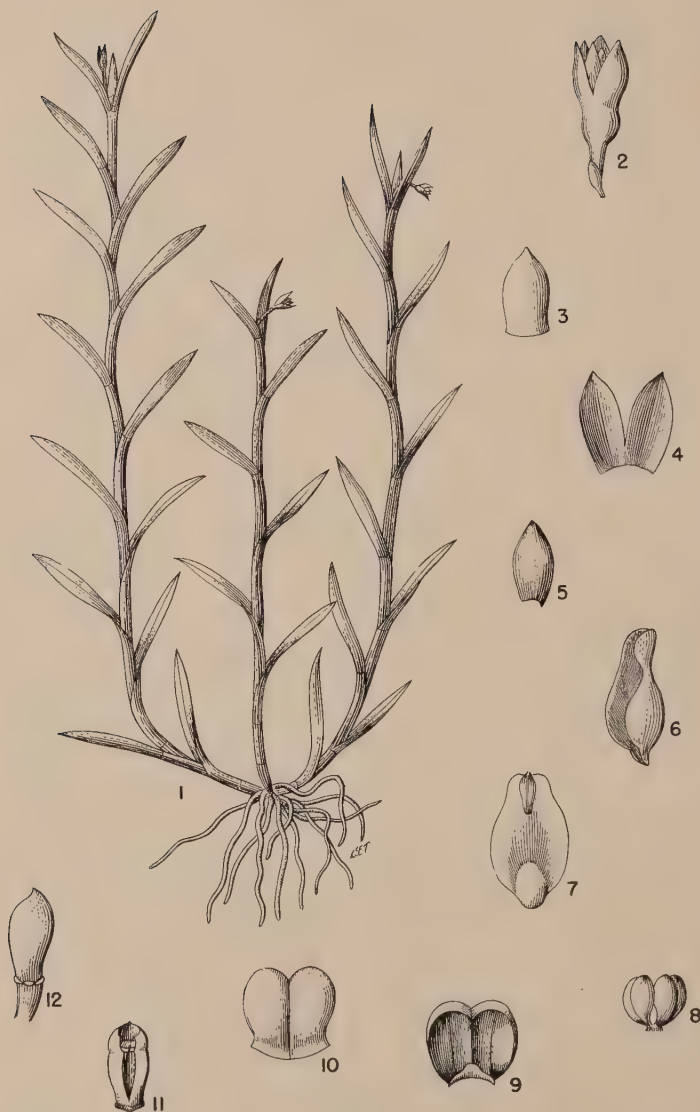


FIG. 103. *Jacquiniella globosa*. 1, plant (about $\times \frac{2}{3}$); 2, flower side view ($\times 5$); 3, dorsal sepal ($\times 4$); 4, lateral sepals ($\times 4$); 5, petal ($\times 4$); 6, lip, side view ($\times 6$); 7, lip, spread out ($\times 6$); 8, pollinia (much enlarged); 9, anther, ventral view (much enlarged); 10, anther, dorsal view (much enlarged); 11, column, ventral view ($\times 8$); 12, column, side view ($\times 8$). Drawn by D. E. Tibbitts.

A West Indian species known from Cuba (Isle of Pines), Puerto Rico, Guadeloupe, Dominica, Martinique, and St. Vincent; rare in Dominica, epiphytic in trees of mossy forests atop the highest peaks—Morne Diablotin (2809). Flowering in April.

13. *EPIDENDRUM MISERRIMUM* Reichb. f.

In Bonplandia iii. 220 (1855); Cogn. in Urb. Symb. Ant. vi. 483 (1910). *Jacquinella miserrima* (Reichb. f.) Stehlé, Fl. Descr. Ant. Franc. i. 172 (1939).

A Lesser Antillean orchid ranging from Guadeloupe to Grenada; in Dominica apparently rare, epiphytic in mountain forests at middle elevations—Laudat (*Eggers* 936 ex Urban); (*Othmer* 76 ex Urban). I have seen no Dominica material. Stehlé records the species as flowering from January to March on the neighboring French Islands.

14. *EPIDENDRUM DURUM* Lindl.

In Hook. Journ. Bot. iii. 87 (1841); Stehlé, Fl. Descr. Ant. Franc. 161 (1939).

Recorded from Guadeloupe, Dominica, Guiana, and Brazil; very rare in Dominica on trees in mossy forests atop the highest peaks—Morne Anglais (2282). In flower from January to March.

15. *EPIDENDRUM RIGIDUM* Jacq. (Fig. 109)

Enum. Pl. Carib. 29 (1760); Griseb. Fl. Br. W.I.I. 618 (1864); Cogn. in Urb. Symb. Ant. vi. 533 (1910); Fawc. & Rend. Fl. Jam. i. 91 (1910); Stehlé, Fl. Descr. Ant. Franc. i. 162 (1939). *Spathiger rigidus* (Jacq.) Small, Britt. & Wils. Bot. P.R. v. 202 (1924).

Widespread in tropical America; in Dominica occasional, epiphytic in woodlands at middle elevations—Milton (2552). Collected in flower in April.

16. *EPIDENDRUM STROBILIFERUM* Reichb. f. (Fig. 110)

In Nederl. Kruidk. Arch. iv. 333 (1859); Griseb. Fl. Br. W.I.I. 618 (1864); Cogn. in Urb. Symb. Ant. vi. 535 (1910); Fawc. & Rend. Fl. Jam. i. 93 (1910); Stehlé, Fl. Descr. Ant. Franc. i. 167 (1939).

Widespread in tropical America; in Dominica occasional, epiphytic on woodland or cultivated trees at middle elevations—Mt. Joy (1278); La Chaudière (3544). In flower from January to March.

17. *EPIDENDRUM RAMOSUM* Jacq.

Enum. Pl. Carib. 29 (1760); Griseb. Fl. Br. W.I.I. 618 (1864); Cogn. in Urb. Symb. Ant. vi. 534 (1910); Fawc. & Rend. Fl. Jam. i. 92 (1910); Stehlé, Fl. Descr. Ant. Franc. i. 163 (1939). *Spathiger ramosus* (Jacq.) Britton, Britt. & Wils. Bot. P.R. v. 202 (1924).

Widespread in tropical America; occasional as an epiphytic plant

EXPLANATION OF FIGURE

FIG. 104. *Polystachya luteola*. Flowering plant (almost $\times 1$); fruiting inflorescence ($\times 1$); 1, flower, side view (about $\times 4$); 2, lateral sepals, spread out to show their attachment to the column foot, and column ($\times 4$); 3, petal ($\times 5$); 4, lip, spread out to reveal lateral lobes and farinaceous callus ($\times 5$). Drawn by Blanche Ames.



B. Ames. 1902.

in mountain forests at middle and higher elevations—Morne Anglais (383); Morne Plat Pays (1722). According to Stehlé this species flowers from September to April.

20. ELLEANTHUS Presl.

1. ELLEANTHUS LONGIBRACTEATUS (Lindl.) Fawc.

Fl. Pl. Jam. 38 (1893); Fawc. & Rend. Fl. Jam. i. 108 (1910); Cogn. in Urb. Symb. Ant. vi. 563 (1910). *Evelyna longibracteata* Lindl., Griseb. Fl. Br. W.I.I. 623 (1864).

Known from Jamaica, Dominica, Colombia, and Ecuador. The habitat of this species in Dominica is not known but, if similar to other members of the genus, *E. longibracteatus* will be found as a rare epiphyte in moist mountain forests at middle and higher elevations. Grisebach noted that the only Dominica specimen (*Imray* 275) of this species was "broader-leaved" than the typical form. On the basis of this character this fruiting specimen (no flowering material has been seen) was set off as var. *latifolius* by Cogniaux who suggested that further Dominica collections may prove this material to represent a distinct new species.

21. STELIS Sw.

Key to Species

- Petioles usually longer than the leaves; racemes much shorter than the leaves; bud hexagonal; dorsal surface of sepals distinctly carinate; lip distinctly trilobate.....1. *S. perpusilliflora*
 Petioles generally much shorter than the leaves; bud trigonous; dorsal surface of sepals not carinate.
 Sepals broadly ovate; lip entire, with a subtruncate apex.
 Leaves oblanceolate with an obtusely rounded tridentate tip; sepals trinerved, with lateral nerves confluent with the central one at the apex.....2. *S. ophioglossoides*
 Leaves elliptical-lanceolate with an acute tridentate tip; sepals trinerved, with lateral nerves free at the apex.....3. *S. scabrada*
 Sepals oblong; lip retuse at the apex, trilobate in front.....4. *S. toepfferiana*

1. STELIS PERPUSILLIFLORA Cogn.

In Urb. Symb. Ant. vi. 386 (1909); Britt. & Wils. Bot. P.R. v. 204 (1924); Stehlé, Fl. Descr. Ant. Franc. i. 181 (1939).

Known from Puerto Rico, Guadeloupe, Dominica, and Martinique; in Dominica rare, epiphytic in forests at middle and higher elevations—Laudat (*Eggers*). This specimen, cited by Cogniaux, represents the only Dominica record for this yellow-flowered species. On the French Islands Stehlé records that flowering occurs from September to April.

2. STELIS OPHIOGLOSSOIDES (Jacq.) Sw.

In Schrad. Journ. Bot. ii. 239 (1799); Griseb. Fl. Br. W.I.I. 611 (1864); Cogn. in Urb. Symb. Ant. vi. 387 (1909); Fawc. & Rend. Fl. Jam. i. 51 (1910); Stehlé, Fl. Descr. Ant. Franc. i. 182 (1939). *Epidendrum ophioglossoides* Jacq. Enum. Pl. Carib. 29 (1760).

A species of tropical America; common in Dominica as an epiphyte in mountain forests at middle and higher elevations—Laudat (1967); Morne Plat Pays (1700, 1704, 1723). The greenish-yellow flowers

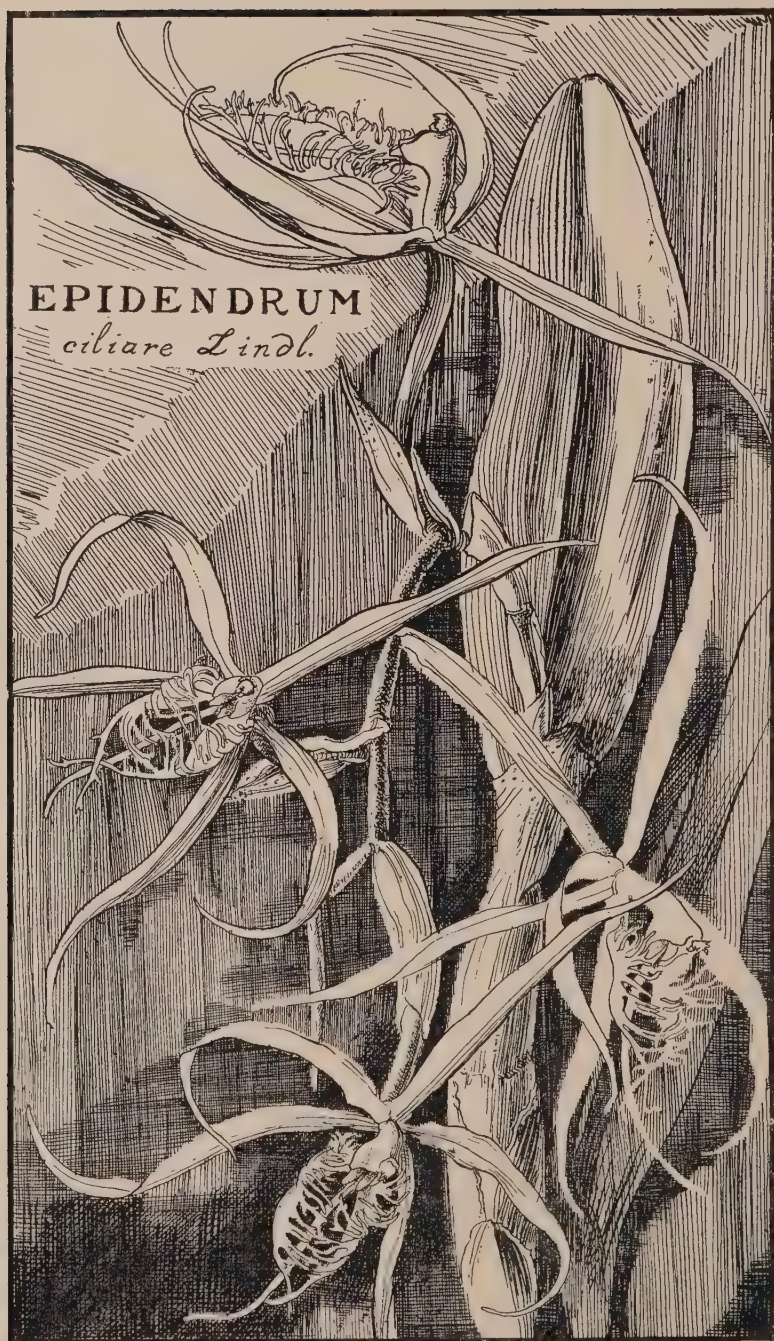


FIG. 105. *Epidendrum ciliare*. Plant ($\times 1$). Drawn by Blanche Ames.

with purple lips appear from August to February. According to Cogniaux the dense racemes are generally much longer than the leaves, but all my Dominica specimens possess racemes much shorter than the leaves.

3. *STELIS SCABRIDA* Lindl.

In Ann. Nat. Hist. v. 115 (1840); Stehlé, Fl. Descr. Ant. Franc. i. 183 (1939). *S. ophioglossoides*, Griseb. Fl. Br. W.I.I. 611 (1864), as to Dominica plants.

Known only from Guadeloupe, Dominica, and St. Vincent; in Dominica common, epiphytic, high on forest trees at middle elevations—La Chaudière (3519); Lisdara (390); valley of Pegoua River, vicinity of Deux Branches (3483). The racemes of this species are more slender than those of the preceding and the greenish-yellow flowers are more distant and do not appear closely distichous in fruit. In flower from November to May.

4. *STELIS TOEFFFERIANA* Reichb. f.

In Flora Ixix 556 (1886); Cogn. in Urb. Symb. Ant. vi. 390 (1909).

A rare endemic orchid, epiphytic in forests at middle elevations—Laudat (Eggers 996). This species, known only from the Eggers type, has apparently been seen only by Reichenbach.

22. *PLEUROTHALLIS* R. Br.

Key to Species

Lateral sepals united.

Plants very small, caespitose, with leaves standing 4 cm. or less above the spreading roots; secondary stems short; peduncles many flowered, strongly zigzag at the flowering tip; flowers with perianth-members hyaline streaked with purple; sepals long caudate-acuminate, ciliate; petals long fimbriate; lip three-lobed, triangular.....1. *P. urbaniana*

Plants larger, caespitose, with leaves usually standing at least 8 cm. above the rootstock; secondary stems long.

Leaves standing 12 cm. or more above the rootstock; blades 6–12 cm. long, 1–3 cm. broad, acute to acuminate at the apex; inflorescence with yellow-green flowers aggregate in fascicles; sepals long acuminate.....2. *P. ruscifolia*

Leaves standing usually less than 12 cm. above the rootstocks; blades 2–4 cm. long, 4–8 mm. broad, rounded at the tridentate tip; inflorescence a many-flowered raceme; flowers yellowish.....3. *P. pruinosa*

Lateral sepals free.

Secondary stems long.

Leaves large, ovate, petiolate; racemes half as long as the leaves; petals 3-nerved, obovate to spatulate with a truncate apex.....4. *P. imrayi*

Leaves small, narrowly oblong; sessile; racemes as long as the leaves; flowers yellowish; petals 1-nerved, lanceolate, acute.....5. *P. floribunda*

Secondary stems very short or absent; leaves petiolate; flowers violet-purple; sepals ciliate, long aristate-acuminate.....6. *P. aristata*

1. *PLEUROTHALLIS URBANIANA* Reichb. f.

In Ber. Deutsch. Bot. Gesell. iii. 279 (1885); Cogn. in Urb. Symb. Ant. vi. 411 (1909); Britt. & Wils. Bot. P.R. v. 205 (1924); Stehlé, Fl. Descr. Ant. Franc. i. 198 (1939).

A species of Puerto Rico, Guadeloupe, Dominica, and Martinique;



FIG. 106. *Epidendrum cochleatum* var. *triandrum*. Plant ($\times \frac{2}{3}$); 1, column, front view, to show the three anthers ($\times 2$); 2, cross section of capsule ($\times 1$); 3, fruits ($\times 1$). This plant has three anthers instead of one; otherwise it is the same as the typical form. Drawn by Blanche Ames.

in Dominica common as a diminutive epiphyte of forest trees at middle and higher elevations—Laudat (1778); Lisdara (371, 2344, 2488); Morne Anglais (388); Morne Plat Pays (1727); valley of the Pegoua River, vicinity of Deux Branches (3451). Collected in flower from March to September. My collection number 2488, collected intermixed with 2344, represents a form of this species with solid yellow-orange perianth parts, and lacking entirely the purple streaks.

2. *PLEUROTHALLIS RUSCIFOLIA* (Jacq.) R. Br. (Fig. 111)

In Ait. Hort. Kew. ed. 2. v. 211 (1813); Griseb. Fl. Br. W.I.I. 608 (1864); Cogn. in Urb. Symb. Ant. vi. 405 (1909); Fawc. & Rend. Fl. Jam. i. 58 (1910); Britt. & Wils. Bot. P.R. v. 205 (1924); Stehlé, Fl. Descr. Ant. Franc. i. 193 (1939). *Epidendrum ruscifolium* Jacq. Enum. 29 (1760).

A circum-Caribbean species; in Dominica fairly common, epiphytic in mountain forests at middle and higher elevations—Laudat (Imray ex Urban); Lisdara (372); Morne Anglais (373); Morne Plat Pays (1656). Collected in flower in March.

3. *PLEUROTHALLIS PRUINOSA* Lindl.

Bot. Reg. xxviii. Misc. 75 (1842); Griseb. Fl. Br. W.I.I. 608 (1864); Cogn. in Urb. Symb. Ant. vi. 404 (1909); Fawc. & Rend. Fl. Jam. i. 58 (1910); Britt. & Wils. Bot. P.R. v. 205 (1924); Stehlé, Fl. Descr. Ant. Franc. i. 192 (1939).

Known from Hispaniola to Trinidad and the Guianas; in Dominica common, epiphytic in mountain forests at middle elevations—Lisdara (392, 2489); Morne Plat Pays (3999). Collected in flower in March.

4. *PLEUROTHALLIS IMRAYI* Lindl.

Fol. Orchid. Pleuroth. 9 (1859); Cogn. in Urb. Symb. Ant. vi. 421 (1909); Griseb. Fl. Br. W.I.I. 607 (1864); Stehlé, Fl. Descr. Ant. Franc. i. 204 (1939).

Known only from Guadeloupe, Dominica, and Martinique. Rare, epiphytic in mountain forests at middle and higher elevations. Cogniaux cites an Imray specimen as well as Duss 112 from Dominica but I have seen no material of this species nor has it been found again recently on either Martinique or Guadeloupe.

5. *PLEUROTHALLIS FLORIBUNDA* Lindl.

In Bot. Reg. xxviii. Misc. 73 (1842); Griseb. Fl. Br. W.I.I. 607 (1864); Cogn. in Urb. Symb. Ant. vi. 421 (1909); Stehlé, Fl. Descr. Ant. Franc. i. 205 (1939). *Specklinia floribunda* Lindl. Gen. & Sp. Orch. 9 (1830).

Known from Guadeloupe, Dominica, Martinique, St. Vincent, and Margarita; apparently rare in Dominica, epiphytic in woodlands and forests at middle elevations. The yellowish flowers appear, according to Stehlé, from January to May. The only citation of Dominica collections is of an Imray specimen by Grisebach.

6. *PLEUROTHALLIS ARISTATA* Hook.

In Ann. Nat. Hist. ii. 329 (1839); Griseb. Fl. Br. W.I.I. 608 (1864); Cogn. in Urb. Symb. Ant. vi. 423 (1909); Stehlé, Fl. Descr. Ant. Franc. i. 208 (1939).

Recorded from Guadeloupe, Dominica, Martinique, and British



FIG. 107. *Epidendrum nocturnum*. Flowering and fruiting plants ($\times 1$). Drawn by Blanche Ames.

Guiana. An epiphyte of moist forests at middle and higher elevations. According to Stehlé in flower during June and July. Cogniaux cites a number of Dominica collections—those of Henslow, Imray, Ramage, and Eggers (90)—but I have seen no material from this island.

23. LEPANTHES Sw.

1. LEPANTHES sp.

This genus of very small epiphytic orchids has until now remained unknown in Dominica. A specimen from Morne Plat Pays (1684) collected by me has been assigned to this genus, but unfortunately the plants lack flowers, the old racemes alone being present. The specimen in question closely resembles *L. tridentata* Sw. which is known (also *L. pulchella* Sw. and *L. fulva* Lindl.) from the neighboring French Antilles.

24. BRACHIONIDIUM Lindl.

1. BRACHIONIDIUM SHERRINGII Rolfe.

In Kew Bull. 4 (1893); Cogn. in Urb. Symb. Ant. vi. 451 (1910); Fawc. & Rend. Fl. Jam. i. 77 (1910); Stehlé, Fl. Descr. Ant. Franc. i. 215 (1939).

Ranges sporadically in the Antilles from Jamaica to Grenada; in Dominica fairly common, creeping as an epiphyte in mats of moss on the limbs of twisted trees of the mossy forest atop the highest peaks—Morne Anglais (2294); Morne Trois Pitons (389, 1382). In flower in August and in February.

25. OCTOMERIA R. Br.

1. OCTOMERIA GRAMINIFOLIA (L.) R. Br.

In Ait. Hort. Kew. ed. 2. v. 211 (1813); Griseb. Fl. Br. W.I.I. 611 (1864); Cogn. in Urb. Symb. Ant. vi. 453 (1910); Stehlé, Fl. Descr. Ant. Franc. i. 221 (1939). *Epidendrum graminifolium* L., Sp. Pl. ed. 2. 1363 (1763).

Essentially a Lesser Antillean (Caribbees) species; in Dominica common, epiphytic in woodlands and forests at middle elevations—Laudat (*Imray* ex Grisebach); Lisdara (360). The yellow flowers with red on the lip probably bloom throughout the year.

26. XYLOBIUM Lindl.

Key to Species

- Pseudobulbs slender, elongate; flowers white; sepals linear-lanceolate, obtuse; petals obtuse, nearly as long as the sepals.....1. *X. pallidiflorum*
 Pseudobulbs short, ovoid or conical; flowers yellowish-white; sepals oblong-lanceolate, acuminate; petals acute, half as long as the sepals.
2. *X. palmifolium*

1. XYLOBIUM PALLIDIFLORUM (Hook.) Nichols

Dict. Gard. iv. 225 (1887); Cogn. in Urb. Symb. Ant. vi. 588 (1910); *Maxillaria pallidiflora* Hook. in Bot. Mag. t. 2806 (1828); Griseb. Fl. Br. W.I.I. 627 (1864).

A West Indian species apparently rare in Dominica, epiphytic in moist forests at middle elevations—valley of Pegoua River, vicinity of Deux Branches (2973). Collected in flower in April.



FIG. 108. *Epidendrum difforme*. Plant, in fruit ($\times 1$); flower, front view ($\times 1\frac{1}{3}$).
Drawn by Blanche Ames.



FIG. 109. *Epidendrum rigidum*. 1, plant ($\times 1$); 2, lip and column, front-side view ($\times 5$); 3, flower, side view ($\times 3$); 4, anther (enlarged). Drawn by Blanche Ames.

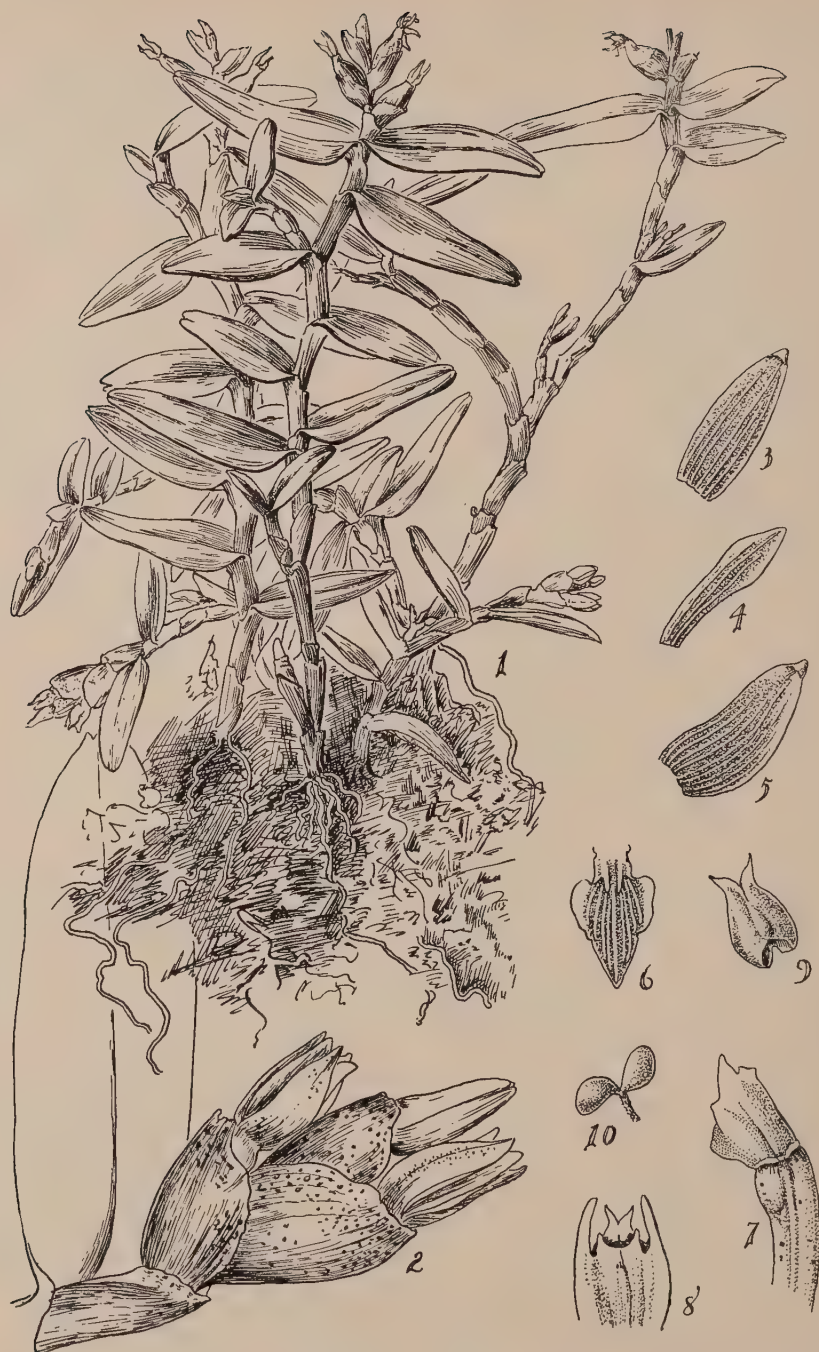


FIG. 110. *Epidendrum strobiliferum*. 1, plant ($\times 1$); 2, inflorescence ($\times 4$); 3, dorsal sepal ($\times 6$); 4, petal ($\times 6$); 5, lateral sepal ($\times 6$); 6, lip ($\times 6$); 7, column and upper part of ovary, side view ($\times 10$); 8, column, front-ventral view ($\times 10$); 9, anther (enlarged); 10, pollinia (much enlarged). Original drawing by Blanche Ames; redrawn by G. W. Dillon.

2. XYLOBIUM PALMIFOLIUM (Sw.) Benth.

Ex. Fawc. Flow. Pl. Jam. 39 (1893); Cogn. in Urb. Symb. Ant. vi. 588 (1910); Fawc. & Rend. Fl. Jam. i. 115 (1910); Britt. & Wils. Bot. P.R. v. 208 (1924). *Maxillaria palmifolia* Lindl., Griseb. Fl. Br. W.I.I. 627 (1864). *Epidendrum palmifolium* Sw. Prodr. 123 (1788).

A West Indian species rare in Dominica as an epiphyte in moist forests at middle elevations. The sole Dominica record of this species is an Imray specimen cited by Grisebach.

27. MAXILLARIA Ruiz et Pav.

Key to Species

- Pseudobulbs 2-leaved; leaves ca. 5 cm. long; flowers solitary.....1. *M. inflexa*
 Pseudobulbs 1-leaved; leaves 6 cm. or more long; flowers in axillary fascicles.
 Pseudobulbs basal; leaves basal, 10-35 cm. long; flowers red with long acuminate petals; lip slightly 3-lobed; disc thickened to the middle.....2. *M. coccinea*
 Pseudobulbs aerial; leaves basal and cauline, 6-8 cm. long; flowers apricot color with acute petals; lip trifid; disc conical, bearing at its middle two tubercles.....3. *M. croceorubens*

1. MAXILLARIA INFLEXA (Lindl.) Griseb.

Fl. Br. W.I.I. 626 (1864); Cogn. in Urb. Symb. Ant. vi. 606 (1910). *Camaridium inflexum* Lindl. in Ann. Nat. Hist. v. 116 (1840).

A rare endemic epiphyte of moist forests at middle elevations—Laudat (*Eggers* ex Cogn.). The specimen on which Lindley based this species plus the Eggers specimen are the only known collections of a plant whose generic relationship has been twice questioned (by Grisebach and Cogniaux).

2. MAXILLARIA COCCINEA (Jacq.) L. Williams

Ex Hodge in Am. Orch. Soc. Bull. xxiii. 42 (1954). *Ornithidium coccineum* (Jacq.) Salisb., Griseb. Fl. Br. W.I.I. 626 (1864); Cogn. in Urb. Symb. Ant. vi. 609 (1910); Britt. & Wils. Bot. P.R. v. 210 (1924); Stehlé, Fl. Descr. Ant. Franc. 231 (1939). *Epidendrum coccineum* Jacq. Enum. 29 (1760).

Known in the West Indies from Hispaniola to Trinidad, also in Venezuela and Colombia; common in Dominica, epiphytic in moist forests at middle elevations—Fon Pays, on the western ridge of Morne Diablotin (2867); Laudat (1829); Lisdara (2328); in the valley of the Pegoua River, vicinity of Deux Branches (3477). Collected in flower in March and April.

3. MAXILLARIA CROCEORUBENS (Reichb. f.) L. Williams

In Caldasia i. no. 5.16 (1942). *Ornithidium croceorubens* Reichb. f. in Linnaea xi. 35 (1877); Cogn. in Urb. Symb. Ant. vi. 610 (1910); Stehlé, Fl. Descr. Ant. Franc. i. 234 (1939).

Recorded from Haiti, Guadeloupe, and Dominica where it occurs as a rare epiphyte in mossy forests at higher elevations—Morne Plat Pays (1698). Collected in March in early fruit. Stehlé records it flowering in Guadeloupe from November to February.

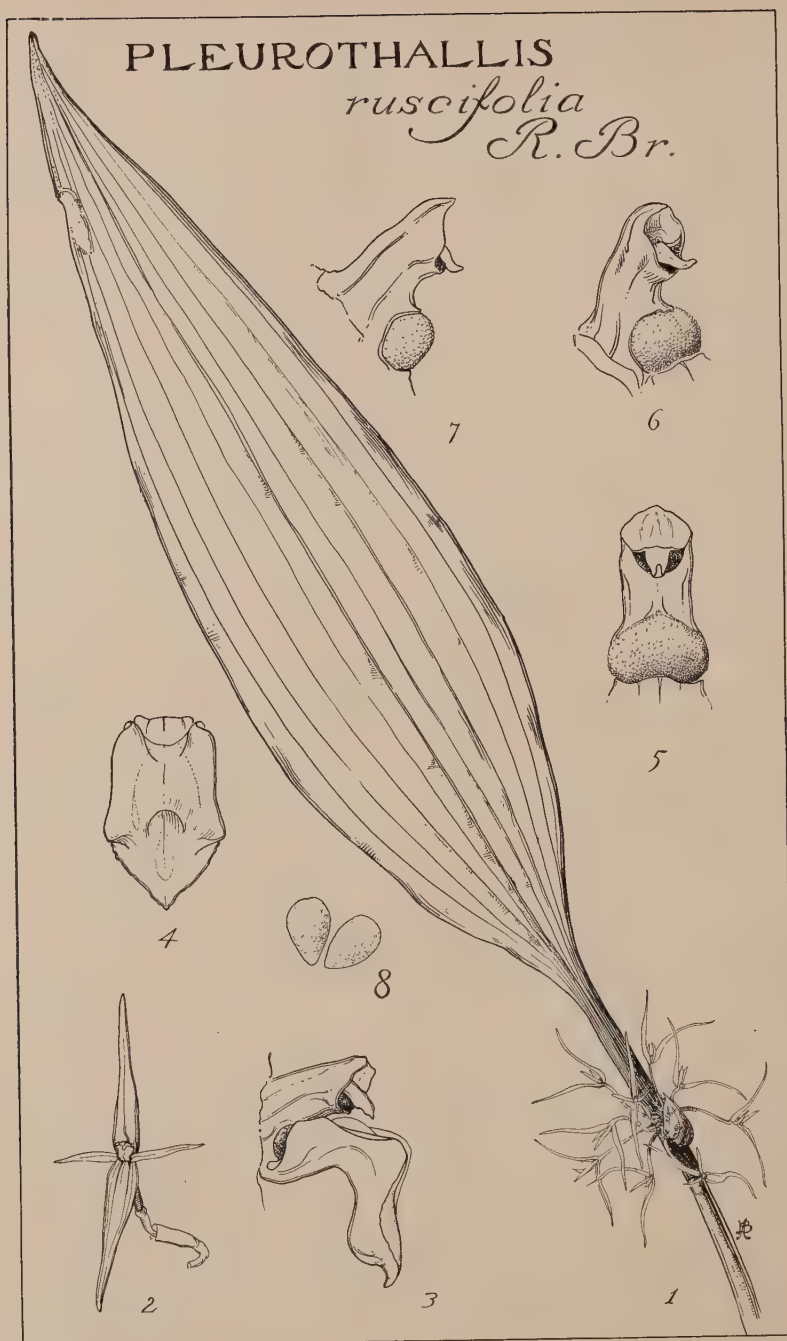


FIG. 111. *Pleurothallis ruscifolia*. 1, leaf and inflorescence ($\times 1$); 2, flower, front view ($\times 2$); 3, lip and column, side view (anther removed; $\times 10$); 4, lip, from above ($\times 10$), 5, 6, and 7, column, from different angles, to show pulvinate foot, rostellum, and stigmatic orifice under rostellum (anther removed; about $\times 15$); 8, pollinia (much enlarged). Drawn by Blanche Ames.

28. ONCIDIUM Sw.

Key to Species

- Pseudobulbs absent; leaves equitant, short, not longer than 10 cm.; scapes less than 1 m. long; flowers yellow; labellum bilobed, larger and showier than the other perianth members. 1. *O. urophyllum*
- Pseudobulbs present (frequently very small); leaves flat, long, over 30 cm. long; scapes 1 m. or more long; flowers yellow mottled with brown; labellum large but not more showy than other perianth parts.
- Pseudobulbs large, ovoid or ovoid-oblong, compressed; flowers yellow with brown blotches; wings of the column subrotund, not produced at the base; pollinia long and narrowly stipitate; glands small, unappendaged. 2. *O. altissimum*
- Pseudobulbs very small (sometimes absent); flowers yellow, densely brown-blotted; wings of the column fleshy, deflexed; pollinia sessile; glands thick appendaged. 3. *O. guttatum*

1. ONCIDIUM UROPHYLLUM Lodd.

In Lindl. Bot. Reg. xxviii. 54 (1842); Cogn. in Urb. Symb. Ant. vi. 653 (1910). *O. tetrapetalum* Griseb. Fl. Br. W.I.I. 631 (1864), as to Lesser Antillean citations.

Recorded in the Lesser Antilles from Antigua and Dominica; in Dominica on cultivated or woodland trees at sea level on the lee coast—growing on a calabash tree, Macoucherie (3763). Collected in flower in May. An Imray collection is also known from Dominica.

2. ONCIDIUM ALTISSIMUM (Jacq.) Sw. (Bee Orchid)

In Vet. Akad. Handl. xxi. 240 (1800); Griseb. Fl. Br. W.I.I. 632 (1864); Cogn. in Urb. Symb. Ant. vi. 643 (1910); Britt. & Wils. Bot. P.R. v. 212 (1924); Stehlé, Fl. Descr. Ant. Franc. i. 244 (1939). *Epidendrum altissimum* Jacq. Enum. 30 (1760).

Originally described from Martinique; in Dominica a large epiphytic or rarely lithophytic orchid, common in woodlands and forests at middle elevations—La Chaudière (3593); Lisdara (2490); valley of Pegoua river, vicinity of Deux Branches (3475). Flowering in April and May.

This is perhaps the most showy of the local orchids and is sometimes cultivated in local gardens. The clumps reach such a large size that forest floors are sometimes littered with fallen plants especially after a severe windstorm.

3. ONCIDIUM LURIDUM Lindl. (Fig. 112)

Bot. Reg. ix. t. 727 (1823); Griseb. Fl. Br. W.I.I. 632 (1864). *Oncidium guttatum* (L.) Reichb. f.; Urb. Symb. Ant. vi. 647 (1910); Stehlé, Fl. Descr. Ant. Franc. i. 248 (1939).

Widespread in tropical America from Florida and Mexico to northern South America; in Dominica probably epiphytic in moist forests at middle elevations. Cogniaux (in Urban) cites an Imray specimen of this species but I have seen no Dominica material.

29. LEOCHILUS Knowles et Westc.

1. LEOCHILUS LABIATUS (Sw.) Ktze.

Rev. Gen. Pl. 656 (1891); Cogn. in Urb. Symb. Ant. vi. 662 (1910); Fawc. & Rend. Fl. Jam. i. 134 (1910); Britt. & Wils. Bot. P.R. v. 213 (1924); Stehlé, Fl. Descr. Ant. Franc. i. 254 (1939). *L. cochlearis* Lindl. ex. Griseb. Fl. Br. W.I.I. 634 (1864). *Epidendrum labiatum* Sw. Prodr. 124 (1788).



FIG. 112. *Oncidium luridum*. 1, basal portion of plant and part of inflorescence ($\times \frac{1}{2}$); 2, flower ($\times 1\frac{1}{2}$); 3, basal portion of lip, to show callus and column, spread out ($\times 2\frac{1}{2}$). Drawn by G. W. Dillon.

A West Indian orchid; in Dominica quite rare, epiphytic in moist forests at middle elevations—La Chaudière (3678). The yellow-green flowers appear from April to June.

30. DICHAEA Lindl.

Key to Species

Leaves articulate at the sheath, somewhat separate, ascending; flowers greenish; fruit smooth.

Flowers greenish, punctate with purple.....1. *D. picta*.

Flowers pale green.....2. *D. rendlei*.

Leaves persistent; close and dense, reflexed; fruit muricate.

Leaves smooth, oblong or elliptical-oblong; rounded at the apex; flowers yellowish; lip not saccate, sessile, connate at the base.....3. *D. muricata*.

Leaves denticulate, ciliate; flowers yellowish; lip long and narrowly unguiculate.....4. *D. hystericina*.

1. DICHAEA PICTA Reichb. f.

In Saund. Ref. Bot. ii. t. 84 (1869); Cogn. in Urb. Symb. Ant. vi. 674 (1910).

Occasional as an epiphyte in moist forests at middle elevations—valley of the Pegoua River, vicinity of Deux Branches (3481). First records for Dominica and first extension of range outside of the type locality, Trinidad. Flowering in April.

2. DICHAEA RENDLEI Gleason

In Bull. Torr. Bot. Club liv. 604 (1927).

A rare epiphytic species known in the Lesser Antilles only from Guadeloupe and Dominica, in wet forests at middle elevations—La Chaudière (3509). First record for Dominica. Flowering in late May and June.

3. DICHAEA MURICATA (Sw.) Lindl.

Gen. & Sp. Orch. 209 (1833); Griseb. Fl. Br. W.I.I. 624 (1864); Cogn. in Urb. Symb. Ant. vi. 671 (1910); Fawc. & Rend. Fl. Jam. i. 137 (1910); Britt. & Wils. Bot. P.R. v. 214 (1924); Stehlé, Fl. Descr. Ant. Franc. i. 263 (1939). *Cymbidium muricatum* Sw. Act. Upsal. vi. 71 (1799).

Widespread in tropical America; in Dominica occasional, pendent on trees, in woodlands and forests at middle elevations—Lisdara (353, 2484); Laudat (*Imray* 139 ex Urban); Morne Gombo (ex Urban). Collected in flower in February, March, and August.

4. DICHAEA HYSTRICINA Reichb. f.

Flora xxxviii. 279 (1865); Cogn. in Urb. Symb. Ant. vi. 672 (1910); Britt. & Wils. Bot. P.R. v. 215 (1924); Stehlé, Fl. Descr. Ant. Franc. i. 261 (1939).

Known only from Cuba, Puerto Rico, Guadeloupe, Dominica, and Grenada; apparently very rare in Dominica at middle and higher elevations—Laudat (*Eggers* 973); Roseau (*Othmer* 54). On Guadeloupe, flowering from December to February (ex Stehlé). I have seen no Dominica material but Cogniaux has cited the above two numbers from the island. The Othmer specimen probably was not collected in Roseau; possibly it came from near the headwaters of the Roseau River which would put it in the vicinity of Laudat, the locality of the other collection.

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Cardenasiodendron, a New Genus of Anacardiaceae (Rhoideae)

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While working recently on the preparation of a monograph of the genus *Loxopterygium*, study of the extremely rare *Loxopterygium brachypterum* Loes. showed it to have the inflorescence typical for *Loxopterygium* and to have flowers in general similar to that genus, that is polygamodioecious flowers with calyx lobes 5, petals 5, stamens 5, a 5-lobed disk, and a tricarpellary pistil with only one fertile carpel. The flower parts and the leaves differed sufficiently from other species so that either would be sufficient to set it aside as a distinct species. However, the fruit were arrestingly different from those of the other species of *Loxopterygium*, all of which have Acer-like samaras with a single terminal thin wing. This species has a considerably flattened fruit with two very unequal lateral wings, suggestive of the fruit of *Pseudosmodingium* of Mexico. However, in *Pseudosmodingium* the body of the fruit and its almost equal lateral wings are much more flattened.

These differences seem sufficient to me to set this taxon apart as a separate genus. The genus is named in honor of Dr. Martín Cárdenas, of Cochabamba, Bolivia.

In order to show the position of this genus in relation to other similar genera, a key² to the (Western Hemisphere) members of the Rhoideae having one-celled fruit, with the radical laying against the cotyledons, and the flowers with as many stamens as petals, is given:

1. Drupe compressed upwards into a wing; style lateral on the fruit; poisonous trees.
 2. The entire fruit wall thin, perianth five parted. South America. *LOXOPTERYGIUM* Hooker f.
 2. The epicarp thin, endocarp thick and bony. South America. *SCHINOPSIS* Engler in Mart. & Eich.
1. Drupe not compressed upwards into a wing, if winged then the wings lateral on the fruit.
 2. Styles lateral on the fruit; pedicels of the sterile flowers at length becoming plumose; leaves simple. Asia, Europe and North America. *COTINUS* [Tourn.] Miller

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²See also: Fred A. Barkley. A Key to the Genera of the Anacardiaceae. American Midland Naturalist 28: 465-474. 1942.

3. Stigma or style more or less at the apex of the ovary.
4. Drupe strongly compressed; leaves imparipinnate.
 5. Drupe cordate; margin of wings long pilose. Colombia and Venezuela.....*OCHOTERENAEA* Barkley
 5. Drupe reniform, glabrous or at least nearly so.
 6. Drupe with two broad lateral wings which are more or less equal. Mexico.....*PSEUDOSMODINGIUM* Engler..
 6. Drupe with two narrow lateral wings decidedly unequal. Bolivia.....*CARDENASIODENDRON* Barkley, *nov. gen.*
4. Drupe neither compressed nor winged; leaves various.
 5. Calyx in fruit enlarging; layers of the fruit wall not finally separating. South America.....*ASTROMIUM* Jacquin
 5. Calyx in fruit not enlarging.
 6. Layers of the fruit-wall not finally separating.
 7. Endocarp thin; leaves pinnate; poisonous.
 8. Leaves sinuate to spinose; seed bony. Tropical America.....*COMOCLADIA* Linnaeus
 8. Leaves entire; seed chartaceous. West Indies.....*METOPIMUM* P. Brown
 7. Endocarp thick, bony; mesocarp fleshy; leaves compound. West Indies and Central America.*MOSQUITOXYLUM* Krug & Urban
 6. Layers of the fruit wall finally separating in various ways; seed basal.
 7. Ovary upon a gynophore formed by the disk; epicarp clothed with filiform silky hairs over three mm. long. Mexico.....*ACTINOCHEITA* Barkley
 7. Ovary not upon a column; epicarp when clothed with hairs, with hairs less than one and a half mm. long.
 8. Drupes red, noticeably pubescent with red glandular hairs; mesocarp resinous.
 9. Flowers in dense terminal thyrsi, appearing after the leaves; bracts linear-lanceolate, caducous, one subtending each flower; bracteoles absent; branches thick with thick pith. Asia, Europe and North America.....*RHUS* Linnaeus
 9. Flowers in terminal and lateral compound spikes, appearing with or before the leaves; bracts deltoid or ovate, persistent, one bract and two bracteoles subtending each flower. North America.....*SCHMALTZIA* Desveaux
 8. Drupes white or dun-colored; glabrous or sparingly pubescent, pubescence on fruit when present never glandular nor red; mesocarp waxy.
 9. Sterile carpels forming a line down the side of the fruit; drupe very small; mesocarp without fibers; leaves coriaceous, simple; inflorescence a terminal thyrus; innocuous evergreen shrub. California.....*MALOSMA* Engler in de Candolle
 9. Sterile carpels not detectable at maturity; drupes over 2.2 mm. in diameter; mesocarp with "fibers"; leaves thin, ternate or imparipinnate; inflorescence a lateral panicle; poisonous, deciduous small trees, shrubs or vines. Asia, North America and northern South America.*TOXICODENDRON* [Tourn.] Miller

This key follows closely that of Engler in Engler & Prantl's *Die Natürlichen Pflanzenfamilien* and the separation of the genera by most recent author's except for differences in opinion regarding the circumscription of genera.



PLATE 1.—Fruit and seed of various members of the Tribe Rhoideae of the Anacardiaceae. A & B. Fruit and seed of *Schinopsis Quebracho-colorado* (Schlecht.) Barkl. & Meyer from *Stuckert 9451*; C & D. Seed and fruit of *Loxopterygium Grisebachii* Hieron. & Lorentz from *Rojas 7369*; E & F. The fruit and seed of *Ochoterena colombiana* Barkl., from *Killip 34772*; G & H. The seed and fruit of *Pseudosmodium Andrieuxii* Engl. from *Andrieux 184*; I & J. Seed and fruit of *Cardenasiodendron brachypterum* (Loes.) Barkl. from *Steinbach 3873*. (All $\times 5$.) Drawings by Stela Vaca.

Reference to Plate 1 showing fruits of the various truly winged Western Hemisphere genera of the tribe Rhoideae of the Anacardiaceae, show that the fruit of *Cardenasiodendron* differs distinctly from the other genera.

***Cardenasiodendron* Barkl., n. gen.**

Arbor ligno durissimo atque gravissimo. Folio imparipinnata 3-4-juga. Paniculae in paniculam compositam, paniculae ideo ramulis extimis speciformibus. Calyx sub fructu persistens, 5-lobus. Petala 5. Stamina 5. Samara parva, subreniformi-obovata, emarginato et stylos 3, ala erecta rotundata, inaequilateralibus. Semine obliquo, curvato.

Tree with hard heavy wood. Leaves imparipinnately compound with 7 or 9 leaflets. Inflorescence a compound panicle with the ulti-



FIG. 1.—Fruiting inflorescences of Tribe Rhoideae: A. Portion of fruiting inflorescence of *Cardenasiodendron brachypterum* (Loes.) Barkl. from Steinbach 3873. B. Portion of fruiting inflorescence of *Pseudosmodingium Andrieuxii* Engl. from Andrieux 184. C. Portion of fruiting inflorescence of *Loxopterygium Grisebachii* Hieron. & Lorentz from Steinbach 3874. (All X 2.5). Drawings by Stela Vaca.

mate branches spikelike. Calyx with 5 lobes. Petals 5. Stamens 5. Samara small, rotundly subreniform-obovate, flattened, emarginate at apex and bearing 3 styles, wings lateral, unequal. Seed oblique, curved.

Monotypic:

***Cardenasiodendron brachypterum* (Loes.) Barkley, n. comb.**

Loxopterygium brachypterum Loes. in Loes. ex. Herzog, Meded. Rijks. Herb. Leiden 27: 84. 1915.

The very excellent original description for the species follows,

taken from Loesener y Herzog. Herzog Bolivien Pflanzen II: Anacardiaceae. Meded. Rijksherb. Leiden 27: 84. 1915:

***Loxopterygium brachypterum* LOES. sp. n.**

"Arbor ligno durissimo atque gravissimo. Ramuli novelli sub lente brevissime puberuli, 4-5 mm crassi. Folia imparipinnata, supra parcius subtus densius brevissime puberula, 3-juga, rarius 4-juga, 20-25 cm longa, modice et tenuiter petiolata, petiolo 3, 5-6 cm longo, internodiis inter juga 2, 5-3 cm longis, foliolis terminali aequali 1-2, 2 cm longe petiolulato excepto sessilibus vel tantum brevissime usque 0, 4 cm. longe petiolulatis = inaequilateralis, ovato-lanceolatis usque oblique lanceolato-ellipticis, basi cuneatis, apice longiuscule et sensim acuminatis vel anguste acutis, margine serrulatis, 6-13, 5 cm longis (petiolul. additis), 1, 5-3, 5 cm latis, tenuiter chartaceis vel submembranaceis, supra. i. s. olivaceis vel fusciscentibus vel plerumque = atro-olivaceis, subtus pallidioribus, costa supra conspicua subplana, indumento denso attamen brevissimo et tenerrimo pallescente, subtus prom-



FIG. 2.—Leaves of *Cardenasiodendron* and related genera. A. Leaf of *Pseudosmodingium Andrieuxii* Engl. from Andrieux 184. B. Leaf of *Cardenasiodendron brachypterum* (Loes.) Barkl. from Steinbach 3873. C. Leaflet of *Loxopterygium Grisebachii* Hieron. & Lorentz from Steinbach 3874. (All $\times .5$). Drawings by Stela Vaca.

inula vel vix prominula, nervis lateralibus, densiusculis atque numerosis, rectis vel subrectis, sub angulo 75° - 80° patentibus, non vel tantum iuxta marginem obsolete reticulatis, supra saepe pallescentibus planis, subtus tenuissime prominulis vel tantum conspicuis. Paniculæ in paniculam compositam 15-25 cm longam ambitu pyramidalem terminalem coalitæ, sub lente dense et brevissime puberulae, pedicellis ultimis subnullis, paniculae ideo ramulis extimis spiciformibus. Flores minimi sessiles, tantum alabastris valde juvenilibus notis. Calyx sub fructu persistens, 5-lobus, sub lente minutissime puberulus, lobis late deltoideis obtusis sub lente



PLATE 2.—Portion of the specimen of *Herzog 1244* from the Leiden Herbarium showing the fruit and leaves of *Cardenasiodendron brachypterum* (Loes.) Barkl. $\times .9$



PLATE 3.—Isotype of *Cardenasiodendron brachypterum* (Loes.) Barkl., Herzog 1244 from the Herbarium at Berlin-Dahlem. (Photograph through the courtesy of the Chicago Natural History Museum.)

ciliolatis, circ. 0, 5 mm longis et vix 1 mm latis. Petala 5 haec illa sub fructu persistentia, i. s. fusciscentia, ovato-subrhombea, libera, nervo medio crassiusculo, circ. 1 mm longa. Stamina (sub fructu) 5 inter lobos disci brunnei annularis et breviter obsoleteque 5—lobi = emarginatos inserta, filamentis i. s. brunneis subulatis calycis lobos paullulo superantibus, antheris iam lapsis vel rudimentariis. Samara parva oblique subreniformi-obovata, circ. 6 mm longa et 3 mm lata, latere superiore obliquo medio paullulum emarginato et stylos 3 brevissimos persistentes vel labentes circ. 0, 5 mm longos i. s. brunneos gerente, ceterum i. s. pallida, brevissime bialata, ala altera erecta rotundata, altera deflexa obtusa, semine obliquo circ. 3 mm. longo et 2 mm lato, embryone curvato.

"Vulgärname: Arandaibuso."

"Im Caipipendital in 1000 m Höhe (no. 1244, mit jungen Blüten u. reifen Früchten im Dezember 1910).

"Am nächsten mit *L. Huasango* SPRUCE verwandt, das durch breitere, an der Spitze stumpfere Blättchen, längere Behaarung, etwas längere Blütenstiele und besonders durch längere Fruchtlügel von *L. brachypterum* LOES. abweicht. Durch die ausserordentlich kurzen Fruchtlügel nimmt diese Art eine etwas isolierte Stellung in der Gattung ein."

Tree of 10 meters with new branches shortly puberulent; leaves imparipinnately compound with 7 to 9 leaflets, 20 to 25 cm. long, petiole 3 to 6 cm. long, internodes 2 to 3 cm. long, the terminal equal or slightly larger than the lateral leaflets; leaflets shortly petiolulate, cuneate at base, acuminate at apex, margin serrate, 7 to 12 cm. long, 1.5 to 3.0 cm. broad, subcoriaceous, lighter below, at first finely puberulent; inflorescence 10 to 25 cm. long, a compound panicle with the ultimate branches pubescent, spikelike; flowers small, sessile, subtended by 3 triangular ovate, acuminate, pubescent bracts; calyx lobes 5, persistent, pubescent, obtuse, about .5 mm. long, 1 mm. broad; petals ovate-oblong, about 1 mm. long; stamens 5, alternate with the lobes of the disk; ovary tricarpellate with 1 fertile carpel; fruit an obovate-subreniform samara with two unequal wings, 5 mm. long and 5 mm. broad, .8 mm. thick; seed oblique, curved.

Specimens examined:

BOLIVIA: Santa Cruz: Caipendital, 1000 m. alt., Dic. 1910, Th. Herzog 1244 (Leiden) with flower and fruit; Valle del Chilon: 1600 m., "frutos pegosos", 27 Marzo 1920, J. Steinbach 3872 (LIL) with fruits.

The leaves of Steinbach's specimen are almost glabrous and the fruit are only 3.5 by 3.5 mm. Further collections may show this to be a distinct species.

Notes on the Pileate Hydnums. II.

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In 1863 (7, p. 349), Fries said of a new *Hydnum*—"Inter multa mirabilia, quam patria nostra ex Hydnum grege offert, hoc principem facile tenet locum"—and along with other descriptive information included the following—" . . . pileus constat e duobus stratis, quorum inferius cum stipite contiguum et simile, lignoso-suberosum, superius vero et crassius formatur e fibris strigosis erectis densissime stipatis, e quarum apicibus superficies hispida. . . . Stipes lignosus, . . . extus intusque flavidum! pallescens, qualis color in nullo Hydno suberoso visus. . . . Pileus . . . alutaceus! ; . . . subtus . . . tectus aculeis . . . ex albo flavidis, demum fusciscentibus. Jove udo spongioso-bibulum et compressum *succum flavidum* fundit,".

In other words, this "species mirabilis" (9, p. 604), is distinguished by light colors of the carpophores and the yellow juice, a thick and very strigose layer on the surface, and a context of the pileus which is duplex in the manner customary with many species of the present-day *Calodon* but which is quite different from the woody substance of the stipe.

Although the description given by Fries, including the few salient features just repeated, would appear to be a sufficient basis for a satisfactory concept of a species not only valid but, moreover, very distinctive, the simple fact is that on this continent there has been considerable confusion and difference of opinion concerning species resembling *Hydnum mirabile* Fr. There has been some question as to whether or not this species occurs in North America, and further, this corky-tough species that is obviously a *Calodon* has been confused with species which equally obviously belong in the fleshy genus *Hydnum*.

Peck (11, pp. 111-112) apparently was not completely satisfied with his identification of a collection from Port Jefferson, Long Island, (see fig. 1) as this species, because on the label he later penciled in "*H. cristatum* Bres.". He noted that the odor of his specimens when the flesh was cut or broken was farinaceous, and the taste at first the same but quickly hot or peppery, as in certain species of *Russula* or *Lactarius*, and he added that his plants were grayish-buff to brownish-buff instead of the yellow of Fries's description or the pale yellow of his figure (8, pl. 3, fig. 2). As to the nature of the context, Peck was somewhat confusing. He stated that the substance of the stipe and pileus, except for the upper stratum of the latter, was brittle when fresh but compact and slightly or lineately zoned, becoming hard and woody when dry. He then added that the substance "might be called compactly fleshy when fresh and moist". On the other hand, early in the discussion he said that the "structure is of that peculiar character ascribed by Fries to his species, and which apparently suggested the specific name, *mirabile*", and stated that "it has some points of agreement with *H. acre* Quel. But Quelet fails to notice any difference in

texture in the upper and lower strata of the pileus in his plant, a feature well shown by our specimens and strongly emphasized by Fries in the description of *H. mirabile*".

Bresadola decided that some specimens collected in North Carolina by Atkinson constituted a new species, which was named *H. cristatum* Bres. (1, p. 119). This description was not very complete. It gave the consistency as fleshy but included no details on the make-up of the context, or on odor or taste, and no comment or discussion of any sort.

Banker (2, pp. 140-141), in his description of *Sarcodon cristatus*, gave the substance as fleshy to somewhat tough, and since he made no mention of a duplex nature it would be assumed as obvious that it was simple, especially in this genus. In a rather unsatisfactory discussion following, he mentioned the specimens determined by Peck as *H. mirabile* and pointed out the supposed differences between the two entities. He is definite to the effect that *H. mirabile* is not the same as *H. cristatum* but he seems to imply that he wonders if Peck's specimens are actually *H. mirabile* because of the lack of conspicuousness in differences in texture between the upper and lower strata of the pileus. He thought there was "good reason, as was suggested by Peck, to refer these plants to *Hydnum acre* Quélet.", but in the absence of authentic specimens of the latter, he thought it best to treat *S. cristatus* as a good species. Later, however (3, p. 13), with European specimens sent by Bresadola at hand, he decided that "the acrid taste noted in both the European and American plants confirms the diagnosis of their identity (*H. cristatum* and *H. acre*—auth.), as this character is not common in the *Sarcodons*", and he called the species *Sarcodon acre* Quélet.

Lloyd (10: Letter 49, Note 136, p. 12, Jan. 1914; Letter 53, Note 168, p. 9, & Note 186, p. 11, Nov. 1914; Letter 58, Note 264, p. 5, July 1915) arrived at some very definite conclusions but he is confusing because of his over-simplification of the situation. He expressed confidence in Peck's judgment that the latter's specimens were the same as the Swedish species (i.e., *H. mirabile*). Then referring to two collections from Massachusetts, he said "Our American plant has a sharp, peppery taste when fresh and is supposed to be the same as is found in France and called *Hydnum acre* by Quelet. Then Atkinson sent our American plant to Bresadola, who discovered that it was a "new species", and Atkinson published it as *Hydnum cristatum*". Then, with specimens at hand recently found in Sweden after 60 years, he stated that "On comparison of the Swedish plant with our American specimens, there is no doubt in my mind that they are the same plant", although in the dried specimens he could "not detect the acrid taste which this species is reported as having when fresh". He next said that he could not agree that *H. acre* was the same as *H. cristatum*, for "*Hydnum cristatum* is a synonym for *Hydnum mirabile*, a rare plant in Northern Europe, more common with us in the East, but comparison of undoubted specimens from Europe of *Hydnum acre* with *Hydnum mirabile* show them markedly different. The surface is entirely different, also the context, which in *Hydnum acre* is hard when dried and almost ligneous, while it is quite soft in *Hydnum mirabile*. I do not believe they are forms of one species". His final

note was that most assuredly specimens of *Hydnum acre* Quélet received from the Abbé H. Bourdot in France were "not the same plant as our "acid species" (*Hydnum mirabile*) as has been stated".

Coker (5, p. 374) disagreed with Banker's last conclusion concerning the fleshy, acid species and, agreeing in this respect with Lloyd, restored the combination *Sarcodon cristatus* for the American species. In a re-written description of the North Carolina specimens, he gave the flesh as "firm, elastic, concolorous, zonate, not duplex except for the collapsed hairs", with the odor and taste as customarily presented, but with no mention of any special differences in the substance of the stipe from that of the pileus.

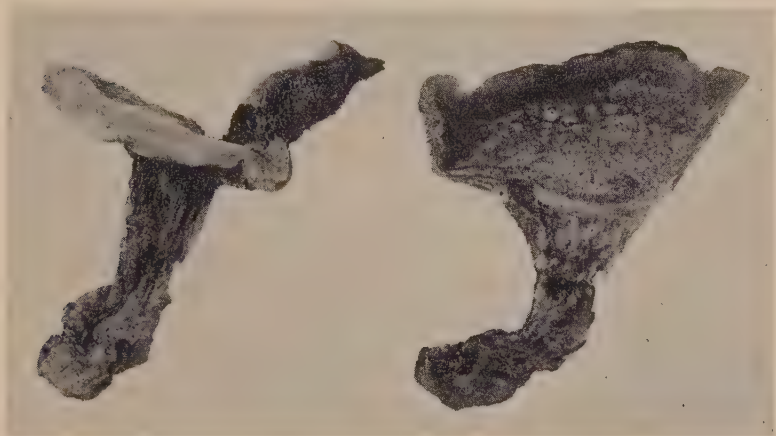


FIG. 1. One of Peck's specimens of *Hydnum cristatum* in the dried condition, giving side-view and section-view. The triplex nature of the substance of pileus and stipe is visible to a certain extent. Present size.

Wehmeyer (12, pp. 100-101) reported the collection of a species in Nova Scotia, which he determined as *Hydnellum mirabile* (our fig. 2). From material that was not luxuriant, he presented a brief but good description which lacked only one desirable detail and added worthwhile comments and discussion. He mentioned the "stout, squat, convex build, their light-brown colour, their densely strigose-tomentose surface and watery-hygrophanous character, the yellow juice staining the flesh dark brown wherever bruised", and the acid taste. He described the substance as watery-tough and duplex; with the upper portion spongy-hairy—that is, with the entire fruit-body made up of three sorts of substance as follows:—a spongy-hairy layer on top and differing watery-tough or fibrous-corky layers in the lower portion of the pileus and in the stipe. Further information later received from Wehmeyer was to the effect that the substance of the stipe dried hard and stony, with a consistency similar to that of weathered oak wood.

By way of summary up to this point, then, it may be noted that specimens of pileate hydnums collected in the eastern United States with cristate surface and acrid taste have variously been assigned three specific epithets. Further, excluding for the moment any consideration of the relation of Quélet's *H. acre* to the problem and keeping in mind the incompleteness of comparative descriptive detail in the various treatments and discussions, it is plain that two different hydnaeous entities are concerned—one, that of Fries and Wehmeyer with

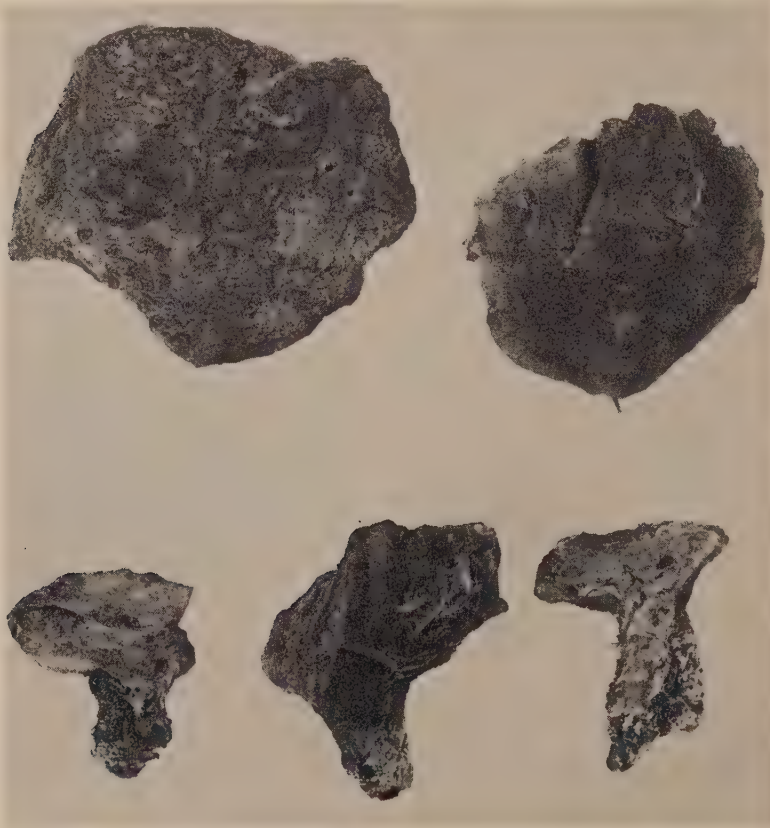


FIG. 2. Part of Wehmeyer's Nova Scotia collection of *Calodon mirabilis* in the dried condition; upper left, upper surface-view; upper right, from below; lower left and right, sectional views; lower center, side-view of entire fruit body. All present size.

corky-tough to woody consistency and duplex context of the pileus, *H. mirabile* Fr., and the other of Peck, Bresadola and Atkinson, Banker, Lloyd, and Coker with fleshy or elastic consistency and context of the pileus not duplex when fresh, *H. cristatum* Bres. *apud* Atkinson.

Quite recently, Coker and Beers (6, pp. 40 and 41) reviewed the more important aspects of the situation and came to tentative con-



FIG. 3. *Calodon mirabilis* from the Province of Quebec. In the two lower figures, the thickness of the spongy-hairy, upper layer of the context is evident and the triplex structure of the entire substance can be seen, although it is not so plain in these two particular sections. Natural size.

clusions. They say that since the publication by Atkinson of Bresadola's *H. cristatum*, collections of this species have usually been reported as *H. mirabile* Fr. or *H. acre* Quél. They think that *H. acre* can be dismissed as a possible synonym. They examined the seven collections labelled *H. mirabile* in the Lloyd collection—one from Sweden, one each from Nova Scotia, New Hampshire and New York City, and three from Massachusetts, most of the specimens of which are small or in poor condition. The Swedish and Nova Scotian specimens were collected under conifers. Of the specimens from the United States the only evidence of habitat was an oak twig in the New York collection, although it may be said that the other collections came from country that is essentially hardwood. They also cite the collections by Wehmeyer (1940) and Bisby *et al.* (4) from under conifers, and state that their own southern collections and those of Atkinson were from frondose woods or mixed woods, with one exception.

They (Coker and Beers) note that the Swedish and Nova Scotian plants, although small, are very squat and more or less turbinate, with a very thick surface blanket of fibrous tissue, whereas the other specimens from the Lloyd collection are more expanded, have more pronounced stems and have the spongy tissue thinner.

Finally they state—"For these reasons, we think that *Sarcodon cristatus* Bres. should be retained for the plant now known from the United States, while those from Canada may well be considered *H. mirabile*".

For a long time, we have been pondering this problem and making such studies as were possible, and now we can say with complete certainty that Coker and Beers arrived at the proper conclusion. *H. acre* Quél. can be dismissed as a European species not occurring on the American continent, as far as is known at present. The presently known collections from the United States are *Hydnum cristatum* and those from Canada are *H. mirabile*. We would point out, however, that the distinction is only secondarily one of geography or latitude and primarily one of host-associate, as suggested above by Coker and Beers, with *H. cristatum* from under hardwoods or at least in mixed woods and without doubt with oak as the important constituent, and *H. mirabile* associated with spruce-fir mixtures only. It does appear at present that *C. mirabilis* is definitely a northern species where spruce and fir are abundant, and that *H. cristatum* is somewhat more southerly and not present in the extreme northern limits of the oaks. On the other hand, with regard to the former species, one must remember that *H. brevipes* (Coker) Snell occurs commonly in eastern Canada and northern Maine and in the North Carolina mountains, and that *C. geogenius* (Fr.) Karsten, not long ago considered a northern species, so abundant in eastern Canada and also occurring in Massachusetts and New York, was recently found by Coker in the mountains of Georgia.

We have examined, at one time or another in the last 10-12 years, the following material:—the specimens of *H. cristatum* in the New York Botanical Garden; the specimens in the Lloyd collection referred to above; the type collection of *H. cristatum* and other collections by

Atkinson at Cornell University; and Wehmeyer's *H. mirabile*. The last three sets of collections were made available through the kindness of Messrs. Stevenson, Fitzpatrick, and Wehmeyer, respectively.

We have also examined, through the courtesy of the late Dr. Homer D. House, the collection by Peck from Port Jefferson, Long Island, labelled *H. mirabile* Fr. but with "*H. cristatum* Bres." penciled in Peck's hand on the label. After much study and some changes of mind from time to time, we have now decided definitely that Peck was correct in his penciled addition and that his specimens represent *Hydnum cristatum* Bres. *apud* Atk.

Further and perhaps more important, we have been fortunate in obtaining more material of both species, especially of *H. mirabile*. Jackson and Pomerleau independently collected some rather old specimens of this latter species a few years ago, and then in 1951 the present authors obtained excellent and reasonably abundant material in several spruce-fir stands around St. Aubert in L'Islet County, and at Rivière Ouelle in Kamouraska County, in the Province of Quebec

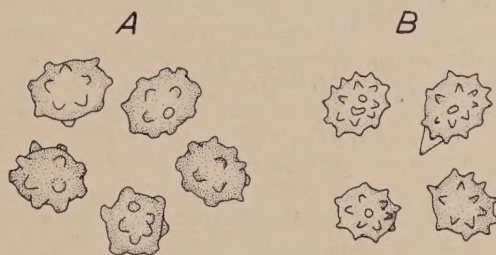


FIG. 4. Spores of—A, *Calodon mirabilis*, and B, *Hydnum cristatum*. $\times 2,000$.

(fig. 3). This species with its dull colors and squat form could hardly be said to possess any intrinsic pulchritude but the first good specimens found by us were beautiful things and aroused the same feeling of exultation that was expressed in a restrained manner by Fries. Not a carpophore was found on the same spots in 1952 or 1953.

And then, last winter along with many other hydnums from Nova Scotia, K. A. Harrison sent two collections which are of great interest. In many ways, these looked about as much like *H. cristatum* as they did like *H. mirabile*—dried flat and compacted, with the hairy surface somewhat eroded or perhaps much weathered, although with the fibrils at least rather long for *H. cristatum*. The habitat data offered no assistance because one lot was noted as from "under hemlocks" and the other "under conifers". These conifers were later learned to be mostly spruce with some balsam and a scattering of white pine, and hence that collection could well be *H. mirabile*. The hemlock association, however, is unusual for either species, although one could wonder if *H. cristatum* could not occur in association with hemlocks as well as with oaks, as some of our Boleti appear to do. It was finally de-

cided, however, that both collections are *H. mirabile*, particularly because of the spores, as will be explained below.

It would seem that entirely aside from the habitats and host-associations the distinguishing of these two species in different genera should not be difficult except under certain circumstances, but it is undeniable that the similarities are strong. The *H. mirabile* of Fries is corky-tough, a true Calodon.¹ The upper layer of the pileic substance is densely felty or spongy-hairy and soft ("e fibris strigosis erectis densissime stipatis"—Fries); the lower layer is domed, firm, compact and corky-tough or fibrous-corky ("lignoso-suberoso"—Fries); both layers are bibulous, exuding a yellow juice ("*succum flavidum*"—Fries); the substance of the stipe is so decidedly woody as to be made shiny when sawed through ("lignosus"—Fries); and all the layers are more or less conspicuously lineately zoned.

Hydnum cristatum, on the other hand, is only just within the limits of the genus *Hydnum*. Its consistency is barely fleshy when young and even then more or less elastic to tough. No one has ever mentioned the presence of a yellow juice. When older and especially when dried, the context is more or less triplex like that of most of the Calodons. There is a thin layer over the surface, thicker in the center, that is spongy-hairy—in our opinion more than merely the surface clothing—and below this the remainder of the pileus is firmer and corky-tough and either distinct from or irregularly intermixed with the woody to bony tissue of the stipe. This is our conception of the structure of the context of the type-specimens and of other material except the over-mature or weathered, which Coker (5, p. 374, and 6, p. 39) described as "not duplex except for the collapsed hairs".

The surfaces of the two species can be very similar when the fruit-bodies are old or have been much exposed to moisture, but the differences can be conspicuous. *H. cristatum* when young is covered with a creamy-white plush, then is densely velvety-tomentose to very strigose-hairy except near the margin, with these hairs (usually branched) at times forming coarse fibrils that may be erect (not more than 2 or possibly 3 mm. high) and when flattened down are almost fibrillose squamules or form more or less anastomosing ridges or crests, and after heavy rains collapse to a spongy-pitted layer. The central portion is often floccose and other areas glabrous. *C. mirabilis*, on the other hand, is covered with a coarse, strigose clothing 5–10 or even 15 mm. thick, which upon drying becomes densely tufted and then variously strigose-pitted or scrupose and finally with most of the strigosity collapsing or disappearing as such into a rough mat. The margin is tomentose to strigose, or possibly glabrous where matted sufficiently.

The surface fibrils of *H. cristatum* arise from a thin mass of collapsed hairs or fibrils, or from the firm context. They are irregular in form, of uneven thickness and usually with a flaring base, light brown under the microscope, the shortest .5 mm. long, mostly 1.5–2.5 mm., with a few as long as 3.5 mm., in thickness a few 16–30 μ , mostly 80–160 μ , with a few

¹*Calodon mirabilis* (Fr.) Snell comb. nov. (*Hydnum mirabile* Fr., Monogr. Hymen. Sueciae II: 349. 1863.)

up to 220 μ , with only the flaring base as thick as 250–320 μ . Those of *C. mirabilis* arise from a thick, spongy mass of hyphae as roughly cylindrical and more or less regular to very irregular hairs, a deep yellow-brown in color under the microscope, 2–3.7 mm. long, some only 15–20 μ thick but mostly 130–210 μ thick, with a few up to 320 μ —or roughly at least 50% larger on the average than those of *H. cristatum*.

The hyphae of the hairs of both species are septate and thin-walled, with a few scattered ones thick-walled, those of *H. cristatum* hyaline or hardly if at all pigmented and those of *H. mirabile* perhaps hyaline but mostly plainly pale-colored.

As far as we know now, there are no reliable differences in the color or colors of the spore-print. Coker and Beers (6, p. 39) give the color of *H. cristatum* as brownish with a vinaceous tint (Fawn Color). We have no variations to report for this species but would not be surprised if some prints showed tendencies toward the drabs, as has been found in many other species of *Hydnum* and *Calodon*. Our fresh prints from *C. mirabilis* have been found to vary between Light Cinnamon Drab (not too far from Fawn Color), Light Brownish Drab and Pale Brownish Drab.

The spores of the two species are slightly different. There is little difference in size, those of *C. mirabilis* measuring 5–5.6 \times 4–4.8 μ , with a few 6 \times 5 μ , and those of *H. cristatum* 4.2–5 \times 3.8–4.2 μ , rarely up to 5.6 \times 4.4 μ . A difference in the ornamentation of the spores can be observed, however, if due care is exercised with enough fresh spores under oil immersion. Some spores will show detectable warts only in profile; these should be disregarded. If mounts of spores are left for some hours, especially in a mounting medium, in some cases the differences are not as obvious. Coker and Beers (6, plate 56, fig. 17) represent the spores of *H. cristatum* very accurately—with distinct tuberculations rather abundant (usually 12–20 warts visible on one side), rather small by comparison, and more or less rounded-pointed or bluntly-pointed, with few, if any, definitely determinable as flat or truncated. The tuberculations of *C. mirabilis*, on the other hand, are fewer to the spore (10–12, rarely 13, warts visible on one side), broader and decidedly more blunt and rounded, only rarely rounded-pointed, with some quite flat or truncated. See Figure 4 for the comparison.

SUMMARY

The previous views with regard to *Calodon mirabilis* and *Hydnum cristatum* are discussed. From a study of the older available specimens and more recent ones found by the authors, it is stated that the northern collections associated with spruce and balsam-fir are *C. mirabilis* and the more southerly ones, including Peck's, under hardwoods, especially oaks, are *H. cristatum*. The external characters and the internal structure of the two species are discussed, and the differences in surface clothing, including the constituent fibrils, and the spores are pointed out.

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